

JAPANESE ENERGY OUTLOOK AND INTERNATIONAL COOPERATION

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1. Formation of a High-Energy-Consumption Type Economy

It was after the 1960s that the Japanese economy has become that of high-energy-consumption type. The volume of energy consumed during fifteen years up to 1975 far exceeded the volume consumed ever since the beginning of Meiji Era up to 1960. Average annual per capita energy consumption during the recent five years was about 4.5 times that in the period prior to World War II. The transition of the economy to that of high-energy-consumption type coincided with the shift of energy from hydraulic power and coal to petroleum.

Energy consumption grew during the 1960s by an average annual rate of 13%. In Japan technological innovation bloomed in the 1960s. Materials industry such as metals, chemicals, and synthetic textile developed modern mass production systems. And mass assembling industry such as automobiles and home use electric appliances developed based on the supply of such materials of a good quality for a low price. Consumers durables rapidly saturated homes, and "throwaway" became a common place. Equipment investments increased in industries, and public investments such as roads and highways and ports and harbors also increased. Heavy and chemical industries was much developed, and the economy grew rapidly. An "affluent society of mass production and mass consumption" was formed.

2. Fragility of Energy Supply Base

This "affluent society" is a grand house built on petroleum. Demand for primary energy expanded from the 95 million tons of 1960 to 284 million tons in 1970, and 87% of this increase was supplied by petroleum--almost all imported.

When rapid economy growth began in Japan under technological innovation, rapid increase in petroleum production began in Middle East and Africa. International oil companies raced to increase their market shares and reduce the price of petroleum. OECD could not stop it. The world entered into an oil age. The Japanese economy took full advantage of low-priced petroleum

supply. But since the beginning of 1970, the international petroleum situation largely changed. Due to worldwide expansion in petroleum consumption, the demand and supply of petroleum became tight. The position of OPEC was strengthened, and nationalism rose in oil producing countries where the government intensified controls over their petroleum resources. The era of abundant supply of low-priced oil ended, and the world entered the era of high-priced oil.

3. Change in Growth Pattern and The Decline of Energy Elasticity

At the time the world's oil situation changed, the pattern of Japanese economic growth also changed. Since the beginning of the 1970s increase in private equipment investments slowed down because new technology had been introduced into all sectors, environmental destruction had advanced, and the spread of consumers durables slowed down. Metals, chemicals, and other materials production increase slowed down. Such growth pattern change and industrial structure change naturally affected energy consumption. And this tendency was accelerated by the energy price hike and economic stagnation since the oil crisis of the fall of 1973.

A review of energy consumption in relation to GNP indicates that consumption in the industrial purposes had been on the decline while that for household purposes had consistently increased. Energy consumption for transportation purposes remained little changed since the 1960s. The ratio of household consumption of energy to total consumption was still too small to cover in full the decline in industrial consumption, and energy elasticity to GNP had declined.

4. Future Economic Growth and Energy Consumption

Japanese economy will need to grow by about 6% annually in order to sustain full employment, to accomplish fuller social security, and to develop public facilities. And it is believed that the economy would have that much of potentiality provided that there would be no limit on energy supply. It will be 0.9 in consideration of the elasticity during the period from 1970 through 1976, future recovery of equipment investment rate, and the estimate (0.91) under the New Energy Plan of the Government of West Germany, energy demand under economic growth of about 6% will be 660 million KL in 1985. Conservation of energy can depress the demand to less than the indicated. If 5.5% saving is achieved, demand will be 625 million KL in 1985.

5. Continuously High Future Reliance on Petroleum

Policy for stable energy supply is conceived of in the direction as indicated below.

- (1) Domestic resources will be exploited as much as possible.
- (2) Development of nuclear power generation will be propelled at social consensus, while making efforts to increase its safety and reliability.
- (3) Of imported energy, the utilization of natural gas and coal will be expanded.
- (4) While reducing reliance on imported petroleum through the above listed measures, petroleum supply source will be diversified.

The possibility of Japan's domestic resources exploitation is low. Also, the development of nuclear power generation will proceed only slowly due to citizens' movement against nuclear power generation. The government inevitably will lower the previous development target of 49,000 MWe by 1985 to 26,000 MWe. Even if smooth operation of these nuclear power plants is assumed, the total volume of energy supplied from domestic sources, including such plants, will be only about 84 million KL (in terms of petroleum).

Therefore, an overwhelming portion of energy demand will have to depend on imports. In order to diversify imported energy, the potential was estimated under the policy that the importation of natural gas (liquidified) and coal will be increased as much as possible.

The total potential supply volume of energies other than petroleum, as discussed in the above, is only 195 million KL (in terms of petroleum), and the balance must depend on imported petroleum. Assuming that 5.5% conservation will be accomplished by 1985, said energy demand will be 625 million KL, which means that 430 million KL (or from 7.4 million barrels per day) of petroleum will have to be imported.

If economic growth of about 6% is to be sustained, continuously greater amounts of petroleum will have to be imported. Even if the source is diversified to China and Indonesia, and overwhelmingly large portion of import will have to come from Middle East. In view of the political instability in Middle East, the energy base of the Japanese economy is extremely fragile.

6. World Limit to Oil Production

Petroleum experts believe that the petroleum production of the world (excluding communist countries) will reach its peak in the first half of the 1990s and will subsequently continue to decline. Main reasons for this are deterioration of discovery rate (new Petroleum fields) and the preservation policy of oil producing country governments.

Discover rate will drop due to the worsening of natural conditions, rise in development costs, decline in investment potentials of international oil companies and national companies. Gap between increasing production volume and discovery rate will open in the shape of scissors,

Long Term Projection of Energy Demand and Supply Balance

Fiscal Year	(Unit)	F.Y. 1975 Actual		F.Y. 1985 Projection	
Demand of Energy before Conservation	M.KL				660
% of Reduction of Energy Demand by Conservation	%				5.5
Energy Demand after Conservation	M.KL	390			625
Type of Primary Energy	M.KW	Actual	%	Estimate	%
Hydro General	M.KW	17.80	5.7	19.50	3.7
Electric Pumped storage	M.KW	7.10		19.50	
Geothermal	M.KW	0.05	0.0	0.50	0.1
Domestic Oil Natural Gas	M.KL	3.50	0.9	8.00	1.3
Domestic Coal	M.TON	18.60	3.4	20.00	2.2
Nuclear	M.KW	6.62	1.7	26.00	6.1
Imported LNG	M.TON	5.06	1.8	24.00	5.5
Imported Coal (steam coal)	M.TON	62.34 (0.50)	13.1	93.00 (6.00)	12.0
Sub Total	M.KL	104.00	26.7	195.00	31.2
Imported Oil	M.KL	286.00	73.3	430.00	68.8
Grand Total	M.KL	390	100	625	100

causing reductions in the volume of proven deposits. When production reserve ratio (R/P) declines to a certain level (10-15), production increase reaches its limit. This is the physical limit of petroleum production increase.

On the other hand, it is doubtful if all oil countries will continue to produce petroleum at the maximum production rate. While countries whose economic developmental potentials are high (Iran, Iraq, Algeria, etc.) will need to increase their revenue by increasing oil production, oil countries of Arabian Peninsula will adopt policy to restrict the volume of oil production due to their excessive revenue from oil, as has already been done by Kuwait and the United Arab Emirates and will eventually be done by Saudi Arabia, the country of world's greatest petroleum resource. When Saudi Arabia curbs the production, oil production of the world will begin to shrink. It is highly possible that the transition from production increase to production decline will take place often the latter half of the 1980s.

If OECD countries fail to conserve on energy and to develop and to expand the utilization of a substitute energy by the time of this transition, but increase demand for OPEC oil, the world will suffer from an oil shortage. Industrial nations will fight each other for securing oil (in which USSR will join), and the price of oil will surely rise and the world politics and economy will be hurt substantially.

The lead time for energy conservation and the successful development of a substitute energy is from ten to fifteen years. Unless OECD countries establish a goal for reduced petroleum consumption in the future and immediately intensify their policy efforts for the energy conservation and substitution of petroleum chronic shortage of petroleum will be inevitable. And if this situation is not avoided, non-oil producing developing nations will be hurt seriously.